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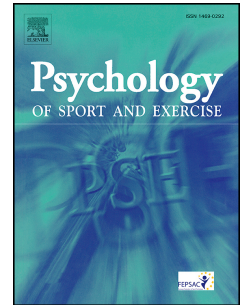
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Running head: SELF-EFFICACY AND PERFORMANCE

Examining the moderating effects of time on task and task complexity on the
within person self-efficacy and performance relationship

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Abstract

Objectives: The study examined two moderating variables that may influence the direction of the effect of self-efficacy upon performance, namely; time spent on task and task complexity. *Design:* Multilevel analysis was conducted to examine within person and between group relationships. *Method:* Eighty eight novice golfers putted in 4 sessions over a period of 2 days (completing 800 putts in total). Each session contained 10 trials of 20 putts. The golfers were split into 2 conditions; a stable task condition where task requirements remained constant across time and a dynamic task condition, where task complexity changed across time. *Results:* In early learning (i.e., the first 10 trials) results revealed a slight negative effect between self-efficacy and subsequent performance. However, across the 40 trials self-efficacy had a positive effect upon subsequent performance. Further, there was a significant task condition (stable vs. dynamic) interaction. In the easy task condition, self-efficacy showed a slight (but non-significant) positive effect upon performance. However, in the dynamic learning condition, self-efficacy had a positive and significant effect upon subsequent performance. *Conclusion:* Previous tests of the within person self-efficacy relationship tend to limit learning to 10 trials or less. The study is the first to examine the reciprocal relationship between self-efficacy and performance as a result of task experience (i.e., time spent on the task) and task complexity simultaneously. Positive effects emerged as a result of extended time learning the task and by varying the degree of task complexity whilst learning.

Keywords: self-efficacy, accomplishments, feedback, negative, moderation

Examining the moderating effects of time on task and task complexity on the within person self-
efficacy and performance relationship

Self-efficacy theory (Bandura, 1977, 1986, 1997) posits that successful mastery experiences help build and maintain robust efficacy beliefs. In turn, such efficacy beliefs help maintain and increase effort and performance (Bandura, 1997). Self-efficacy is defined as “beliefs in one’s capabilities to organise and execute courses of action required to produce given attainments” (Bandura, 1997, p. 3). However, recent research has questioned exactly how useful self-efficacy beliefs actually are in reciprocating its positive effect upon performance (e.g., Beattie, Lief, Adamoulas, & Oliver, 2011; Vancouver & Kendal, 2006; Vancouver, More, & Yoder, 2008; Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001; Yeo & Neal, 2006). For example, Vancouver et al. (2001) stated that there has been an overreliance upon cross-sectional correlational self-efficacy studies and that the self-efficacy and performance relationship may be quite different at the within person level of analysis. In support of this, the above studies revealed a negative relationship between self-efficacy and subsequent performance at this level of analysis.

In explaining why negative self-efficacy effects may occur, Vancouver et al. (2001, 2002) based their hypothesis upon Powers (1973) perceptual control theory. According to Powers (1991) and Vancouver et al. (2001, 2002), self-efficacy could negatively bias one’s perceptions of goal progress. That is, high levels of self-efficacy may be negatively related to the allocation of effort because individuals no longer feel the need to invest maximum effort (see also Vancouver, 2012). Vancouver et al. (2001, 2002) tested this hypothesis in an analytical task (mastermind) and found support for self-efficacy theory in that previous performance was a strong positive predictor of self-efficacy beliefs. However, self-efficacy had a significant negative relationship with subsequent performance, in that high levels of self-efficacy biased one’s perception that a correct solution to the problem was found, when in fact the solution was wrong.

Critics of such research (e.g., Bandura, 2012; Bandura & Locke, 2003) argue that previous tests of the within person self-efficacy/performance relationship are limited in that such tests require “a dynamic rather than a static environment” (p. 96). In other words, when assessing such reciprocal effects, the structure of the on-going activity should be challenging (as challenging tasks seem to serve the impetus for the mobilisation of effort; e.g., Locke & Latham, 1990). Bandura and Locke (2003) further argued that if the task is static and unchallenging, and task requirements remain constant across time, then generally nothing is learnable and performance quickly stabilizes. Further, even in tasks where learning does occur, if it is performed repeatedly over time where learning is limited within one trial and not across task trials, results again can be misinformative (cf. Bandura, 2012; Bandura & Locke, 2003). In other words, even though a learning effect may occur across time, self-efficacy’s effect upon performance may be negated if the task is easy, performed in an unchallenging environment and learning is not derived from previous trials.

To address some of these limitations, Beattie et al. (2011) examined the reciprocal relationship between self-efficacy and performance in novice golfers where motor performance could improve across time. Their two study approach tested such effects in an easy putting condition and a more difficult putting condition. In both conditions participants made a total number of 200 putts across 2 practice and 8 experimental trials (20 putts per trial). Results revealed significant positive growth trajectories for learning and self-efficacy across trials (addressing previous limitations). Further, previous performance had a positive effect upon subsequent self-efficacy. However, self-efficacy had a weak non-significant negative relationship upon subsequent performance at the within person level, showing some support for Vancouver et al.’s hypotheses.

Nevertheless, a number of limitations to these studies remain. By the authors own acknowledgement, the learning paradigm that they used (i.e., 200 uphill putts) may not have provided participants with a significant amount of time (or experiences) which to base self-efficacy judgements upon. In other golf putting studies (e.g., Masters, 1992) learning has been shown to continue over the duration of 500 putts. Further, learning (or task performance) in both studies only increased by 1 putt across the 8 performance trials (7.29 to 8.29 and 4.64 to 5.45 respectively). Likewise, self-efficacy beliefs with regards to successful putts one could make also only increased by 1 across the 8 trials (10.43 to 11.76 and 9.5 to 10.27 respectively). These studies seem to have promoted the environment that Bandura and Locke (2003) argue against using. A further limitation is the way that performance and self-efficacy was assessed. Beattie et al. (2011) used a measure of successful and non-successful putts. In other words, skill learning may have been occurring at the individual level (i.e., they were putting closer to the hole) which went undetected. Therefore, due to these limitations and the importance of the within person self-efficacy debate, it would be pertinent to re-examine these findings.

One further consideration concerns how and when self-efficacy may exert positive and negative effects (or no effect) upon performance. A recent meta-analysis of 38 published and unpublished within person data sets found that approximately one third of these studies revealed negative effects, one third revealed null effects, and one third revealed positive effects between self-efficacy and performance (Sitzman & Yeo, 2013). Further, Sitzman and Yeo reported a number of moderating variables that may determine when self-efficacy had a positive, negative or no effect upon performance (see Sitzman & Yeo, 2013 for a full discussion). One moderating variable related to the present study is task difficulty. Beck and Schmidt (2012) found that in a stock market prediction task, goal difficulty moderated the relationship between self-efficacy and

performance. That is, a negative relationship occurred for those assigned an easy goal and a positive relationship emerged for those assigned a difficult goal (supporting some of the criticisms proposed by Bandura and Locke, 2003). Although Beattie et al. (2011) also examined task difficulty, the fact that putting only increased by 1 across trials (in both easy and difficult conditions) showed that the uphill putting task was too difficult for learning effects to occur.

With regards to the present study, to address the first limitation that a lack of learning occurred in the Beattie et al. study, participants were required to putt over the course of 4 sessions with each session containing 200 putts. This extended the learning time from Beattie et al. from 200 putts to 800 putts. To provide a more accurate level of skill development and performance, a target zone was used to measure putting performance improvements over time rather than absolute putts obtained. The final limitation addressed the possibility that negative efficacy effects may be accounted for by stable easy tasks by splitting the learning task into two learning conditions. Half the participants performed in a static task where task environment remained constant across time. The other half of the participants performed the same putting task but the task environment changed across time. That is, the putting task remained constant across conditions, but a degree of task difficulty was manipulated that changed across sessions.

Hypotheses generally followed that of previous research (e.g., Beattie et al., 2011; Vancouver et al., 2001). First, by addressing previous limitations, performance and self-efficacy should show significant changes across time. Second, previous performance should be a strong predictor of subsequent self-efficacy. Third, if negative self-efficacy effects are mainly due to lack of task experience, then self-efficacy will be negatively related to performance in early learning trials but positively related to performance when learning trials are extended. Finally, as task difficulty has been shown to moderate the relationship between self-efficacy and

performance (e.g., Beck & Schmidt, 2012), then self-efficacy will have a weak negative or non-significant relationship with performance in the stable easy task condition but a positive relationship with performance when the task is more dynamic and challenging in nature.

Method

Participants

Eighty-eight participants (61 men and 27 women, $M_{age} = 24.45$, $SD = 3.79$) volunteered to take part in the study. All participants had either no or minimum experience in golf putting.

Informed consent was obtained from all participants before taking part in the study.

Apparatus

Golf putts were performed on a 12ft x 10ft Huxley flat surface putting green (<http://www.huxleygolf.co.uk>) using a standard Prosimmon KT25 putter and a set of 20 Slazenger Raw Distance 432 dimple pattern golf balls.

Procedure

Participants completed 4 putting sessions over a period of 2 days. Sessions 1 and 2 were completed on day 1 and sessions 3 and 4 were completed the following day. A 15 minute break was provided in between sessions 1 and 2 and sessions 3 and 4. Participants were split into two learning conditions; a static learning condition and a dynamic learning condition. A golf putting task was designed specifically for the study. Each session contained 10 trials of 20 putts.

In the static learning condition, participants were required to putt on a flat surface from a series of 4 starting positions all of which were 240 cm from the hole. To reduce task monotony, each starting position rotated around the hole by 30 cm (the distance from the hole remained constant). A scoring system involved four concentric circles 5 cm apart starting from the perimeter of the hole. Participants were awarded five points for a successful putt; four points if

they missed the hole by 1-5 cm; three points if they missed the hole by 6-10 cm; two points if they missed the hole by 11-15 cm; and one point if they missed the hole by 16-20 cm. No points were awarded for any putts outside 20 cm. The starting position rotated after each trial of 20 putts. As previously stated, putting studies have shown that putting performance in novices increase over the duration of 500 putts (e.g., Hardy, Mullen, & Jones, 1996), therefore we extended the number of trials usually conducted at the within person level of analysis from 8 to 40.

In the more difficult dynamic learning condition, participants were also required to putt at a distance of 240 cm from the hole. In session 1, participants performed 10 trials of 20 putts in identical fashion to session 1 in the static learning condition. In the second session, a block of wood measuring 1000 mm x 50 mm x 50 mm was placed lengthways along the axis between the starting position and the hole under the putting surface 80 cm from the participants' starting position. The participants then had to complete 10 trials of 20 putts over that obstacle from the same starting position. In the third session, the strip of wood was placed 160 cm from the participant (80 cm from the hole) before completing a further 10 trials of 20 putts (from the same starting position). The strip of wood was then removed for the final session where putting requirements mirrored that of session 1. Due to the difficulty of continually moving the strip of wood, putting position in sessions 2 and 3 all putts were taken from the same spot. The timing of the sessions and trial numbers were identical across both conditions. To motivate participants to perform at their best cash prizes of £50, £30, and £20 were offered for the three top participants who had the best individual score in a single trial (0-100 points).

Measures

Self-efficacy. Self-efficacy was assessed in a similar fashion to that of Beattie et al. (2011). Magnitude was assessed with 10 yes/no questions by asking participants to indicate if they believed they were able to improve upon their most recent performance (e.g., “I have the skills and resources to beat my previous score by 1 point”; “I have the skills and resources to beat my previous score by 2 points”; in similar intervals to “I have the skills and resources to beat my previous score by above 10 points”). Participants were also given the opportunity to record a magnitude score of above 10 if they thought they could achieve such a level. Self-efficacy strength was recorded by asking participants to rate the degree of confidence (on a scale of 0-100%) in their ability to perform at each of the levels they had indicated with a *yes*. Self-efficacy strength score was derived by summing all the magnitude levels that were answered with a *yes*. Self-efficacy magnitude and strength were used in all subsequent analyses. Reliability estimates (the reliability of the measure across participants) for self-efficacy magnitude and strength were both .94.

Results

As the self-efficacy questionnaire asked participants to rate how well they could improve upon their last performance, performance improvement was calculated by subtracting the previous trial absolute performance from the subsequent trial absolute performance. For example, after trial 1 participants were required to state how many points they could improve upon in trial 2. The difference in absolute performance scores between trial 1 and 2, was used as the dependent variable (i.e., performance improvement). As there were performance differences between learning conditions (i.e., the static learning condition had a significantly higher absolute performance score than the difficult learning group; $t = 10.97, p < .001$), all variables were standardised within putting condition. The data sets were then collapsed into one data set for

subsequent analyses. To examine the within person level effects, Hierarchical Linear Modeling (HLM; Bryk & Raudenbush, 2002) Version 7 was used throughout. Group mean centering was used for the level 1 variables and grand mean centering was used for the level 2 condition variable.

To examine the proportion of variance that was accounted for by the between group effect (across level 2 units i.e., participants) intraclass correlations (ICC) were calculated for all variables. If the ICC approaches zero, then it may not be appropriate to use multilevel modelling. Intraclass coefficients for self-efficacy magnitude, strength, and performance in the stable task were .16, .18 and .21, indicating that 16% to 21% variance of the variables of interest was accounted for at the between person level. For the dynamic condition, intraclass coefficients for self-efficacy magnitude, strength, and performance were .49, .42 and .54 showing that 42% to 54% variance of the variables of interest was accounted for at the between person level. In this case multilevel modelling was justified. At the between person level of analysis, in both conditions, self-efficacy magnitude and strength had a positive relationship with respective performance improvement (with the exception of self-efficacy strength on performance improvement in session 3 of the easy task condition; see Tables 1, 2 and 3 for means and intercorrelations of all relevant variables). To compare the present set of results to that of Beattie et al. (2011), we first examined the relationship between self-efficacy and putting performance improvement in session 1 (i.e., the first session of 10 trials). Results revealed that performance improvement slightly decreased across time ($\gamma_{10} = -.03, p < .001$; see also Richard, Diefendorff, & Martin, 2006). That is, as learning occurred room for improvement decreased. Self-efficacy magnitude remained constant across time ($\gamma_{10} = -.01, p = .25$) and strength slightly decreased across time ($\gamma_{10} = .035, p < .05$). Previous absolute performance had a significant negative effect

upon subsequent self-efficacy magnitude and strength ($\gamma_{20} = -.63, p < .001$; $\gamma_{20} = -.72, p < .001$). Thus as absolute performance increased across trials, the less participants thought they could improve upon in subsequent trials. After controlling for trial and previous absolute performance, self-efficacy magnitude and strength had slight non-significant negative relationships with subsequent performance improvement ($\gamma_{30} = -.06, p = .15$; $\gamma_{30} = -.04, p = .27$; see Figure 1). This slight negative effect replicates that of Beattie et al. (2011). Further, there was no conditional interaction in session 1 ($\gamma_{31} = .06, p = .45$).

With regard to the within-person set of results across the 4 sessions, performance improvement significantly decreased ($\gamma_{10} = -.005, p < .01$), showing that learning effects slowed across time (as in session 1). Self-efficacy magnitude decreased slightly (not significantly) over trial ($\gamma_{10} = -0.0036, p = .190$) and strength significantly decreased across trial ($\gamma_{10} = -0.009, p < .001$); that is, as participants become more skilled at the task, room for subsequent improvement decreased gradually. Previous absolute performance had a significant negative effect upon subsequent self-efficacy magnitude and strength beliefs above that of trial ($\gamma_{20} = -.663, p < .001$; $\gamma_{20} = -.710, p < .001$). That is, the better the previous absolute performance, the less the participants thought they could improve upon it as learning occurred across time.

The main hypothesis was in relation to the moderating effects of task difficulty on the direction of the self-efficacy and performance relationship. After controlling for trial and previous absolute performance, self-efficacy magnitude (but not strength) had a significant and positive relationship with subsequent performance improvement ($\gamma_{30} = .045, p = .052$; $\gamma_{30} = .037, p = .126$). Finally, there was a marginally significant self-efficacy magnitude¹ \times condition

¹ Snijders and Bosker (1999) state that the power to detect cross-level interactive effects in multilevel research is frequently low because of reductions in parameter reliability, and that a criterion for cross-level interactions may be set at $p = .10$ (cf. Yeo & Neal, 2004).

1 interaction ($\gamma_{31} = .07, p = .069$; see Table 4 and Figure 2) and a significant self-efficacy strength x
2 condition interaction ($\gamma_{31} = .16, p < .001$). The interaction shows that self-efficacy magnitude had
3 a slight positive relationship with performance improvement in the easy task condition, and a
4 strong and positive relationship with subsequent performance improvement in the
5 dynamic/difficult task condition.

6 As a follow up to the interaction, separate analyses were conducted in each condition. In
7 the stable easy task after controlling for trial and previous absolute performance neither self-
8 efficacy magnitude nor strength were significantly related to performance improvement ($\gamma_{30} =$
9 $.051, p = .09$; $\gamma_{30} = .036, p = .27$). However, both self-efficacy magnitude and strength were
10 positively and significantly related to subsequent performance improvement in the challenging
11 condition ($\gamma_{30} = .074, p < .05$; $\gamma_{30} = .062, p = .05$).

12 Discussion

13 The purpose of the study was to examine previous research limitations (e.g., Bandura,
14 2012; Bandura & Locke, 2003; Beattie et al., 2011) that negative effects of self-efficacy upon
15 performance may have materialised due to task characteristics (i.e., stable unchallenging vs.
16 dynamic challenging tasks and task experience). So far research has yet to examine both
17 conditions simultaneously. Results found a significant interaction (across the 40 trials) in that, if
18 the task remains simple and unchallenging, then self-efficacy had little effect upon performance
19 improvement. In contrast, when the task is dynamic and more challenging (but not too
20 challenging; e.g., Beattie et al., 2011), self-efficacy had a positive effect upon performance
21 improvement.

22 Results also support that of previous research (e.g., Beattie et al., 2011) when learning is
23 at an early stage. That is, Beattie et al. found a slight negative relationship between self-efficacy

1 and performance (i.e., total number of putts made) across 8 experimental trials consisting of 160
2 uphill putts. The present study also found this effect across the first 10 trials consisting of 200
3 putts but on a flat surface. Therefore, even in an easier putting condition (compared to Beattie et
4 al., 2011), self-efficacy had a negative effect upon performance improvement in early learning.
5 Further, the direction of the relationship between self-efficacy and performance improvement
6 reversed when participants completed a longer learning time frame (i.e., 40 trials and 800 putts).
7 Therefore, it might be concluded that negative self-efficacy effects may be in part due
8 experimental studies where learning is limited by a short time frame.

9 To the present author's knowledge, this is also the first study to examine the directional
10 efficacy effect upon performance (improvement) as a result of time spent on the task. The
11 majority of self-efficacy studies generally limit learning to a period of 10 trials or less. However,
12 there are some exceptions. For example, Seo and Llies (2009) examined the within person self-
13 efficacy relationship upon stock market performance across 20 days with a sample of 101 private
14 stock investors. They found a significant and positive effect between self-efficacy and subsequent
15 performance. A further strength of this study is that Seo and Llies (2009) used participants that
16 also had a vast experience of knowledge in stock market investment (*Mean* = 4.3 yrs). Contrary
17 to this, Yeo and Neal (2006) found a negative within person self-efficacy relationship in an air
18 traffic control decision task over the course of 30 (2-min) trials (with 4 scenarios in each trial).
19 However, participants were not air traffic controllers. Further, Bandura (2012) argue that Yeo
20 and Neal study is compromised in terms of self-efficacy assessment and confounded
21 experimental design. Nevertheless, Bandura (1997) notes that efficacy beliefs are developed
22 "through largely carefully graded mastery experiences" (p. 397-398). Therefore, one could argue
23 that tasks that are novel and are examined over a relatively short time period, may not allow for

1 sufficient mastery experiences, leaving one to effectively produce their best guesstimate about
2 subsequent performance levels.

3 As stated above, Bandura and Locke (2003) argue that meaningful tests of the self-
4 efficacy and performance relationship should allow for progressive changes in self-efficacy and
5 performance across time, rather than disjointed activities such as the mastermind task (e.g.,
6 Vancouver et al., 2001, 2002). However, research suggests that this might not always be the case.
7 For example, Schmidt and Deshon (2009) replicated the use of Vancouver et al.'s (2001, 2002)
8 'disjointed' mastermind task. They found that prior performance and goal progress moderated the
9 subsequent self-efficacy and performance relationship. Specifically, a positive relationship for
10 self-efficacy and performance occurred when goal progress was below standard and prior
11 performance was poor. Further, following more successful prior performances, self-efficacy had
12 a negative effect upon subsequent performance. Therefore, the present set of findings and that of
13 Schmidt and Deshon (2009) do not fully support the view that tasks that are perceived as easy,
14 unchallenging and disjointed create little incentive, installs complacency and produce negative
15 effects (e.g., Bandura, 2012; Bandura & Locke, 2003).

16 The present study further highlights the importance of moving beyond testing main
17 effects when examining the self-efficacy and performance relationship (e.g., Schmidt & DeShon,
18 2009, 2010). This is particularly important given that Sitzman and Yeo's (2013) meta-analysis
19 found that self-efficacy has a moderate to null effect upon subsequent performance (depending
20 on what moderators were analyzed). Sitzman and Yeo also found that only performance trend
21 (i.e., whether performance increased over time or not) moderated the self-efficacy and
22 performance relationship, in that the relationship was strongest when performance increased over
23 time. However, this effect became null when controlling for covariates such as linear trajectory

(time) and previous performance. Nonetheless, Sitzman and Yeo (2013) were constrained by testing moderators at a meta-analytical level whereas the current study (and others e.g., Schmidt & DeShon, 2009, 2010) tested more refined moderators.

Sitzman and Yeo's (2013) meta-analysis concludes that after controlling for linear trajectory and past performance, self-efficacy had a near zero effect upon subsequent performance. However, after controlling for those two covariates in the present study, self-efficacy had a relatively positive relationship with performance under one specific condition. The conclusion of the present set of findings and that of Schmidt and DeShon (2009, 2010) is that future research should turn away from main effects and continue to look for moderating variables that can explain why and when self-efficacy may have a negative relationship with subsequent performance.

There are some practical implications to consider. It appears that task experience influences the self-efficacy and performance relationship. The current study is as far as we know the first study to examine such an effect. Early in learning a negative effect was shown but the sign of the relationship reversed when all 40 trials were considered. That is, when learning and task experiences increase, more accurate efficacy judgements may be made. Further, in more complex tasks, learning time may provide a useful moderator as more time will be required to benefit from mastery experiences before self-efficacy beliefs may accurately reflect ability.

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1 Table 1

2 *Intercorrelations between mean self-efficacy magnitude (SEM), self-efficacy strength (SES) and performance improvement across the*
 3 *four sessions (1, 2, 3 and 4) in the easy task condition*

| Measure | SEM1 | SES1 | Perf.Imp1 | SEM2 | SES2 | Perf.Imp2 | SEM3 | SES3 | Perf.Imp3 | SEM4 | SES4 |
|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|
| SES1 | .94** | | | | | | | | | | |
| Perf.Imp1 | .22** | .20** | | | | | | | | | |
| SEM2 | .07 | .06 | -.01 | | | | | | | | |
| SES2 | .22** | .18** | .05 | .21** | | | | | | | |
| Perf.Imp2 | -.01 | -.07 | .02 | .30** | .16** | | | | | | |
| SEM3 | .05 | .04 | -.01 | .66** | -.08 | .20** | | | | | |
| SES3 | .20** | .20** | .04 | -.04 | .16** | -.04 | -.01 | | | | |
| Perf.Imp3 | .05 | .05 | .00 | .07 | -.08 | .16** | .32** | .05 | | | |
| SEM4 | .04 | .04 | -.03 | .84** | -.06 | .21** | .84** | -.01 | .26** | | |
| SES4 | .14** | .14** | -.02 | -.05 | .14** | -.09 | -.08 | .23** | -.10 | .17** | |
| Perf.Imp4 | -.06 | .00 | .01 | .20** | -.07 | .28** | .28** | -.02 | .49** | .35** | .18** |

4 ** $p < .01$

1 Table 2

2 *Intercorrelations between mean self-efficacy magnitude (SEM), self-efficacy strength (SES) and performance improvement across the*
 3 *four sessions (1, 2, 3 and 4) in the dynamic task condition*

| Measure | SEM1 | SES1 | Perf.Imp1 | SEM2 | SES2 | Perf.Imp2 | SEM3 | SES3 | Perf.Imp3 | SEM4 | SES4 |
|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|-----------|-------|-------|
| SES1 | .80** | | | | | | | | | | |
| Perf.Imp1 | .14** | .19** | | | | | | | | | |
| SEM2 | .32** | .28** | .04 | | | | | | | | |
| SES2 | .28** | .32** | .02 | .85** | | | | | | | |
| Perf.Imp2 | .03 | -.02 | -.03 | .27** | .33** | | | | | | |
| SEM3 | .29** | .30** | -.00 | .57** | .49 | -.02 | | | | | |
| SES3 | .27** | .28** | -.03 | .42** | .46** | -.01 | .83** | | | | |
| Perf.Imp3 | -.01 | -.02 | -.04 | .00 | -.02 | -.04 | .27** | .31** | | | |
| SEM4 | .30** | .33** | .04 | .50** | .48 | -.03 | .49** | .41** | -.07 | | |
| SES4 | .27** | .33** | .03 | .49** | .50** | -.03 | .48** | .47** | -.09 | .84** | |
| Perf.Imp4 | -.02 | .00 | .04 | .02 | .06 | .00 | .02 | .03 | -.04 | .21** | .23** |

4 ** $p < .01$

Table 3

Means and standard deviation for absolute performance, performance improvement, self-efficacy magnitude and strength for all four sessions and each learning condition

| Session | 1 | 2 | 3 | 4 |
|-------------------------|------------------|------------------|------------------|------------------|
| Static Condition | | | | |
| Absolute Performance | 33.51 (10.39) | 48.87 (10.47) | 49.29 (9.79) | 52.88 (9.88) |
| Performance Improvement | 1.91 (7.34) | 1.34 (7.95) | 1.32 (8.06) | .46 (8.04) |
| Self-efficacy Mag | 6.20 (2.47) | 4.21 (2.69) | 4.20 (2.71) | 4.99 (3.26) |
| Self-efficacy Strength | 496 (252) | 292 (258) | 281 (249) | 350 (308) |
| Dynamic condition | | | | |
| Absolute Performance | 34.90 (18.29) | 38.99 (17.99) | 43.49 (19.51) | 44.60 (18.44) |
| Performance Improvement | 1.41 (14.21) | .10 (14.41) | .75 (14.61) | .36 (15.14) |
| Self-efficacy Mag | 7.74 (5.85) | 7.55 (6.42) | 7.88 (6.66) | 8.90 (7.46) |
| Self-efficacy Strength | 522 (333) | 459 (335) | 483 (352) | 504 (358) |

Table 4

Regression coefficients showing the main and moderating effects between self-efficacy and performance upon stable vs. dynamic tasks

| Self-efficacy magnitude as dependent variable | | | |
|---|--------------------|-------|-------|
| Step | γ | SE | %Var |
| 1. Trial | -0.003 | .002 | 8.22 |
| 2. Previous performance | -0.663*** | .046 | 36.63 |
| Self-efficacy strength as dependent variable | | | |
| Step | γ | SE | |
| 1. Trial | -0.009*** | 0.002 | 8.27 |
| 2. Previous performance | -0.71*** | 0.044 | 40.27 |
| Subsequent performance as dependent variable | | | |
| Step | γ | SE | |
| 1. Trial | -0.005** | 0.001 | .30 |
| 2. Previous performance | -0.833*** | 0.037 | 33.63 |
| 3. Self-efficacy magnitude | 0.045* | 0.022 | 1.50 |
| 3. Self-efficacy strength | 0.037 | 0.024 | 1.51 |
| 4a. Condition Interaction | | | |
| Self-efficacy magnitude | 0.075 ^a | 0.041 | --- |
| 4b. Condition Interaction | | | |
| Self-efficacy strength | 0.168*** | 0.028 | --- |

^a $p < .07$; * $p < .05$; ** $p < .01$; *** $p < .001$.

- 1 *Figure 1.* Individual regression slopes showing the relationship between self-efficacy and
2 performance across both conditions in Session 1.

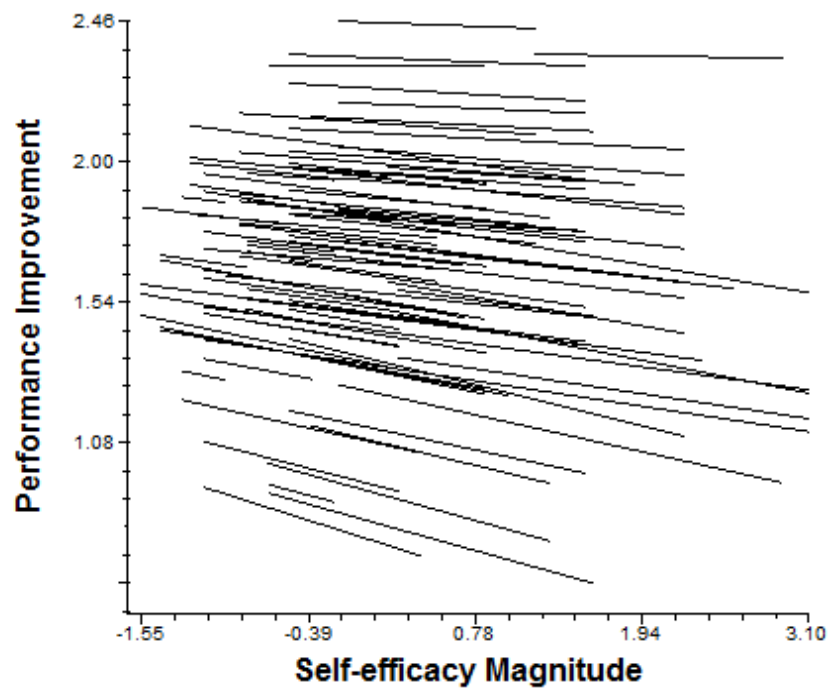
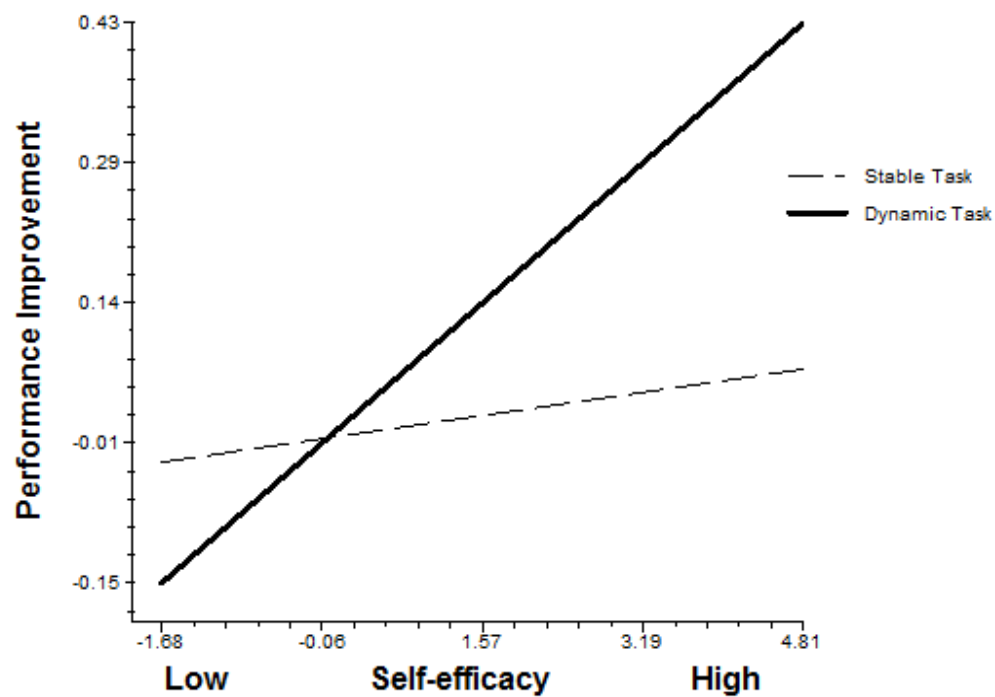


Figure 2. The relationship between self-efficacy and performance across stable vs. dynamic learning condition.



- We examine time on task as a moderator of self-efficacy and performance relationship
- We examine task difficulty as a moderator of self-efficacy and performance relationship
- Time task difficulty moderate the relationship between self-efficacy and performance
- Negative effects occur due to lack of time spent on task
- Positive efficacy effects occur in challenging tasks